2.0 ALTERNATIVES

This section discusses the full range of preliminary alternatives considered for the proposed action and identifies through the screening of those preliminary alternatives which ones are considered reasonable and how and why they were advanced for further study. A discussion of the other alternatives and the rationale for their elimination from further consideration is also included. A description of the design characteristics and the underlying engineering considerations of the reasonable alternatives is provided following the screening discussion.

2.1 PROCESS USED TO DEVELOP AND EVALUATE ALTERNATIVES

Pursuant to 23 USC §139, TxDOT and FHWA, as joint lead agencies, have involved cooperating and participating agencies and the public in a formal scoping process for the US 181 Harbor Bridge Environmental Impact Statement (EIS). Federal, state, and local agencies and the public have been afforded the opportunity to participate in defining the need and purpose and determining the range of alternatives to be considered for the project. Cooperating and participating agencies have also had the opportunity to collaborate on the methodologies to be used and level of detail required in the analysis of the alternatives.

2.1.1 Development of Alternatives

Through this formal scoping process, a preliminary set of alternatives was established (**Figure 2.1-1**). These alternatives include the No Build Alternative, six separate build alternatives (Blue, Green, Red, Orange, Tunnel and West) and a Transportation System Management (TSM) alternative (not depicted). The No Build Alternative is included per 40 CFR 1502.14 (d), which requires that EISs include the consideration of taking no action. Since the Harbor Bridge is eligible for the National Register of Historic Places (NRHP), the requirements of 23 CFR 774 (regulations for implementing Section 4(f) of the Department of Transportation Act) apply to the project. As a result, additional alternatives are also being considered to comply with Section 4(f) regulations. These additional Section 4(f) alternatives, listed in **Section 2.2**, are not screened here, using the criteria to be described below, but rather are analyzed in the draft Section 4(f) evaluation (**Section 5.0**) using the feasible and prudent screening criteria defined in 23 CFR §774.17.

2.1.2 Screening Criteria

FHWA and TxDOT have considered a range of alternatives for the proposed action, and the methodology for determining the reasonable alternatives involves two screening criteria. An alternative is carried forward for detailed evaluation in the DEIS if: 1) the alternative meets the need and purpose for the project; or 2) the alternative avoids the taking of any Section 4(f) property, including the Harbor Bridge, and is both feasible and prudent. (Note that a prudent alternative would by definition meet the need and purpose for the project.) To determine whether an alternative meets the need and purpose of the project, measures of effectiveness, established by the joint-lead agencies through collaboration with

cooperating and participating agencies and the public during the formal scoping process, were applied. Under the second screening criterion an interdisciplinary team of project analysts are studying the aforementioned Section 4(f) alternatives that are required by Section 4(f) regulations (23 CFR 774.3(d)) to be considered when a proposed action would include the use of historic bridges, as this action would.

Alternatives that 1) are found to not meet the need and purpose for the project, or 2) avoid the taking of any Section 4(f) property but are not both feasible and prudent will be eliminated from detailed consideration in the DEIS.

2.1.3 Measures of Effectiveness

To evaluate whether a particular alternative serves the purpose of the proposed project and thereby addresses the identified needs (see **Section 1.1**), the joint lead agencies developed the following measures of effectiveness to apply to each alternative. **Table 2.1-1** identifies a set of criteria for each project purpose, along with detailed measures for evaluating the effectiveness of each alternative in meeting those criteria.

To maximize the long-term highway operability of the US 181 crossing of the Corpus Christi Ship Channel, an alternative would need to reduce the cost and frequency of structure maintenance relative to the existing condition and extend the operational life of the structure well beyond the life of the existing bridge. To meet these criteria, the proposed rehabilitated or replaced structure would be designed with non-corrodible building or maintenance materials (such as concrete) and other elements requiring less maintenance over the life of the structure, and the design-life of the proposed rehabilitated or replaced structure would be 100 years.

To improve safety for the public traveling on US 181 and to establish a reliable, long-term hurricane evacuation route, an alternative would need to correct the existing design deficiencies and upgrade the facility to current National Highway System (NHS) standards (23 CFR 625.4) and the standards in TxDOT's Roadway Design Manual and Bridge Design Manual where appropriate. These improvements would include adding shoulders to the bridge and approaches, reducing the vertical grade and horizontal curvature, providing longer ramps where needed and providing adequate spacing between ramps. To serve as a reliable, long-term hurricane evacuation route, the proposed improvements would be designed to meet the State's standards for determining transportation routes for hurricane evacuation in the Corpus Christi area.

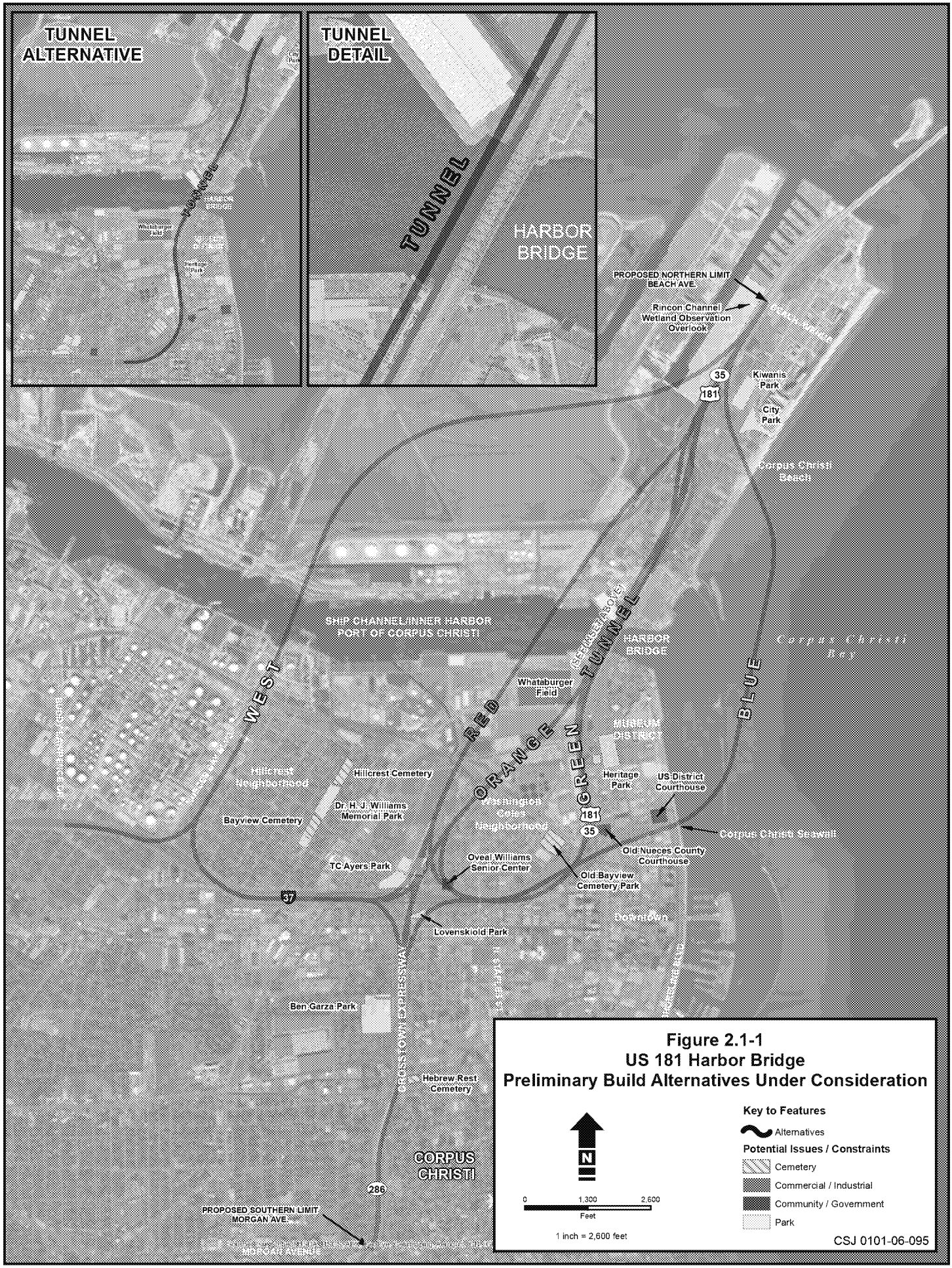

Figure 2.1-1
US 181 Harbor Bridge
Preliminary Build Alternatives Under Consideration

Key to Features

Alternatives

Potential Issues / Constraints

- Cemetery
- Commercial / Industrial
- Community / Government
- Park

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Table 2.1-1 Measures of Effectiveness		
Project Purpose	**Criterion**	**Measure**
Maximize the long-term highway operability of the US 181 crossing of the Corpus Christi Ship Channel	Reduces the cost and frequency of structure maintenance	Uses non-corrodible building or maintenance materials (such as concrete) and other elements to limit the extent, frequency and cost of routine and structural maintenance over the life of the structure
	Extends the operational life of the structure well beyond the expected life of the existing bridge	Uses a 100-year design-life for the rehabilitated or replaced structure
Improve safety for the traveling public, including during hurricane evacuations	Corrects geometric deficiencies	Adds shoulders to the structure and approach sections; reduces the vertical grade and corrects sharp horizontal curves; provides ramp lengths commensurate with design speed; provides sufficient spacing for exit ramps
	Upgrades facility to current design standards where appropriate, allowing for a minimal number of design exceptions when justified due to geometric or environmental constraints	Proposed design meets FHWA standards for the National Highway System (23 CFR 625.4) and TxDOT's Roadway Design Manual and Bridge Design Manual, including associated references
	Serves as a reliable, long-term hurricane evacuation route	Meets State standards for determining transportation routes for hurricane evacuation in the Corpus Christi area

2.2 DESCRIPTION OF PRELIMINARY ALTERNATIVES

The EIS scoping process began with four preliminary build alternatives (Blue, Green, Red and Orange), the No Build Alternative and the TSM Alternative. In response to comments received from the public and cooperating and participating agencies at the first scoping meeting, held August 9, 2011, two new build alternatives (the Tunnel Alternative and the West Alternative) were added to the preliminary set. The following sections provide a brief description of each preliminary alternative. Each of the alternatives described below, if implemented, with the exception of the No Build Alternative and the TSM Alternative, would remove the existing Harbor Bridge and replace it with a new structure.

The Section 4(f) alternatives under consideration to *avoid* the use of the National Register-eligible Harbor Bridge System include: 1) No Build Alternative; 2) Bypass Alternatives—Constructing a New Bridge on a New Alignment and leaving the existing Harbor Bridge in place as a scenic bypass or monument, or Upgrading Nearby Parallel Roadways; and 3) Rehabilitation (Avoidance)–Continued Vehicular Use Carrying Two-Way Traffic, or Continued Vehicular Use as a One-Way Pair. . An analysis of whether any of these enumerated alternatives would be both feasible and prudent is ongoing as part of the draft Section 4(f) evaluation (see **Section 5.0**). In addition to the avoidance alternatives, Rehabilitation (Use) Alternatives are also considered in the draft Section 4(f) evaluation, including 1) Continued Vehicular Use Carrying Two-Way Traffic; and 2) Relocation—move the Harbor Bridge to a new location for rehabilitation and future use.

2.2.1 Blue Alternative

The Blue Alternative begins at Beach Avenue on US 181 and generally follows the existing alignment of US 181 to just north of Burleson Street. The alignment then veers east across Corpus Christi Beach and out into Corpus Christi Bay, passing to the north of the USS Lexington museum. The alignment continues south across the bay and the ship channel, turning west and crossing Shoreline Drive at Spur 544. The alignment then follows I-37 west to North Staples Street.

2.2.2 Green Alternative

The Green Alternative begins at Beach Avenue on US 181 and follows the existing alignment of US 181 south to Burleson Street. The alignment then veers slightly to the west of the existing Harbor Bridge and crosses the ship channel, continuing on the west side of existing US 181 to I-37 and following the existing alignment of I-37 to the interchange with the Crosstown Expressway (alternately known and interchangeably referred to herein as State Highway 286).

2.2.3 Red Alternative

The Red Alternative begins at Beach Avenue on US 181, veers west of existing US 181 just north of Burleson Street, and then crosses the ship channel about 1,500 feet west of existing US 181. The alignment then extends south to I-37 at the interchange with the Crosstown Expressway, continuing south along the Crosstown Expressway ending at Laredo Street.

2.2.4 Orange Alternative

The Orange Alternative begins at Beach Avenue on US 181, veers west of US 181 at Burleson Street and then crosses the ship channel immediately west of existing US 181. The alignment then veers west again and extends south, crosses I-37, and follows the Crosstown Expressway south ending at Laredo Street.

2.2.5 Tunnel Alternative

The Tunnel Alternative begins at Beach Avenue on US 181 and follows the existing alignment of US 181 south to Burleson Street where the north entrance to the tunnel would be located. The alignment then veers slightly to the west of the existing US 181, continuing west of the existing highway and Harbor Bridge and underneath the ship channel. From the south tunnel entrance, the alignment then continues south on the west side of the existing US 181 to I-37 and follows I-37 to North Staples Street.

2.2.6 West Alternative

The West Alternative begins at Beach Avenue on US 181 and then veers to the west nearly parallel to the ship channel. The alternative then turns south, crossing Navigation Boulevard and the ship channel

and continuing south generally parallel and to the east of Nueces Bay Boulevard to I-37. Along I-37, the transition for the West Alternative extends west to Up River Road and east to North Staples Street. Along the Crosstown Expressway, the transition for the West Alternative extends south ending between Comanche Street and Laredo Street.

2.2.7 Transportation System Management

The TSM Alternative is intended to maximize the efficiency of the existing facility with limited construction activity. Typical TSM elements include ridesharing, high-occupancy vehicle lanes, traffic signal timing optimization and restriping of existing pavement sections. The TSM Alternative is limited to improvements within the existing right of way.

2.2.8 No Build Alternative

The No Build Alternative would involve taking no action to address the safety and other problems identified in the *Need for the Proposed Project* discussion in **Section 1.1**. Routine maintenance of the US 181 facility and the Harbor Bridge structure would continue, including pavement work, structural repairs, painting and other rehabilitation efforts. Although the No Build Alternative would not meet the Need and Purpose for the project, it is included in the EIS in accordance with 40 CFR 1502.14 (d) and is carried forward for comparison purposes.

2.3 ALTERNATIVES SCREENING SUMMARY

This section is organized overall by project purpose and by the criteria established under each individual purpose. The build alternatives are discussed relative to whether they satisfy the established measures of effectiveness for each criterion. The No Build Alternative was screened along with the build alternatives, and since it does not satisfy any of the established measures of effectiveness it does not meet the need and purpose for the project. The No Build Alternative, however, is included in the range of reasonable alternatives and is carried forward for full consideration in the DEIS for comparison purposes. Following the Section 4(f) evaluation, additional alternatives could also be considered reasonable and carried forward for full consideration in the DEIS. Variations of the reasonable build alternatives might also be developed in an effort to avoid or minimize impacts to other properties to which Section 4(f) is determined to apply, such as parks and recreational facilities or wildlife and waterfowl refuge lands.

2.3.1 Evaluation With Respect to Project Need and Purpose

2.3.1.1 Maximize the Long-term Highway Operability of the US 181 Crossing of the Corpus Christi Ship Channel

Criterion: Reduces the cost and frequency of structure maintenance

Corrosion is a major factor to overcome in maintaining the structural integrity of the Harbor Bridge. The current steel bridge resides in a saltwater environment, requiring routine cleaning and painting to minimize corrosion. The combination of salt-laden air, year-round windy conditions, and warm air temperatures increases the potential for steel corrosion to occur (TxDOT 2012).

The structural rehabilitation necessary to extend the service life of the existing Harbor Bridge another 15 to 20 years was completed in 2011, although the bridge will still require routine maintenance. Over the past 30 years, maintenance costs have exceeded $70 million, and, based on information provided in the Historic Bridge Team Report, an estimated $47 million (inflation-adjusted dollars) of additional structural repairs are required if the Harbor Bridge is to remain in continued vehicular service until 2050 (TxDOT 2012).

To reduce the need for frequent and costly maintenance of the structure, each of the build alternatives proposing a new Harbor Bridge structure (Blue, Green, Red, Orange and West) would be designed with concrete and other non-corrodible materials. Maintenance would still be required with any of the build alternatives, including the Tunnel Alternative. However, by eliminating materials susceptible to corrosion, the criterion to reduce the cost and frequency of maintenance would be satisfied.

The TSM Alternative would not replace the existing Harbor Bridge; therefore the routine maintenance to prevent corrosion and the anticipated structural maintenance to extend the operational life of the structure would still be needed. The TSM Alternative would not satisfy this criterion and would not meet the need and purpose for the project.

Criterion: Extends the operational life of the structure well beyond the expected life of the existing bridge

As stated under the previous criterion, the existing 1959 Harbor Bridge structure underwent rehabilitation in an effort to extend its operational life to roughly 2030. Bridge inspections from 2007 and 2008 indicate that additional structural maintenance is required for the bridge to remain operational beyond 2030 (TxDOT 2012). Each of the build alternatives, with the exception of the TSM Alternative, is designed for a 100-year life, and although routine maintenance costs would be incurred over the life of any new structure (including a tunnel) structural repairs of the type required for maintaining the integrity of the existing structure are not expected during the design-life.

2.3.1.2 Improve Safety for the Traveling Public, Including During Hurricane Evacuations

Criterion: Corrects design deficiencies

The Blue, Green, Red, Orange, Tunnel and West Alternatives would correct design deficiencies associated with the existing facility and upgrade the facility to current FHWA and TxDOT design standards. Specifically, each of these alternatives would add shoulders to the proposed structure and approach sections; reduce the vertical grade and minimize or eliminate the horizontal curvature on both the north and south ends of the existing bridge; provide entrance and exit ramps with acceleration and deceleration distances as recommended by the standards for the safety of motor vehicles; and provide sufficient spacing between exit ramps.

In the case of the Blue, Red, Orange and West Alternatives, these design deficiencies (as described in **Section 1.1.2**) would primarily be corrected by placing US 181 on a new location alignment and removing the existing US 181 facility between the areas of Beach Avenue and the US 181/I-37 interchange, where the majority of design deficiencies are found. The Green Alternative and the Tunnel Alternative, which essentially follow the existing alignment, would address the horizontal curvature by proposing to straighten the highway alignment as much as practicable. The Green Alternative would address the exit ramp spacing by designing a standard right-hand exit to Staples Street and a dedicated u-turn lane at that intersection to return to the downtown area via a new eastbound frontage road. The Tunnel Alternative would utilize the existing left-hand exit for US 181 southbound to Downtown Corpus Christi.

The TSM alternative would be designed to correct minor design deficiencies but would not add shoulders to the existing bridge or reduce the vertical grade. Without these safety improvements, the TSM alternative would not satisfy this criterion and would not meet the need and purpose for the project.

Criterion: Upgrades facility to current design standards where appropriate, allowing for a minimal number of design exceptions when justified due to geometric or environmental constraints

Each of the build alternatives, including TSM, would be designed to meet the NHS design standards (23 CFR 625.4) and the standards in TxDOT's Roadway Design Manual and Bridge Design Manual, including applicable reference documents. The Blue, Green, Red, Orange, West and Tunnel Alternatives would each satisfy this criterion. The TSM Alternative would not make the upgrades necessary to improve safety for the traveling public, namely adding shoulders to the existing bridge and reducing the vertical slope; therefore, the TSM Alternative would not satisfy this criterion and would not meet the need and purpose for the project.

Criterion: Serves as a reliable, long-term hurricane evacuation route

Under the State of Texas Hurricane Response Plan (Texas Department of Public Safety 2010), a supplement to the State of Texas Emergency Management Plan, TxDOT is assigned the responsibility to identify the most appropriate highways meeting evacuation requirements; to implement short- and long-term solutions to reduce congestion on highway evacuation routes; and to prioritize infrastructure projects that address obstructions on evacuation routes.

The Green, Red, Orange and West Alternatives would each meet TxDOT's standards for an appropriate hurricane evacuation route for the Corpus Christi area. These alternatives would provide adequate capacity to facilitate evacuation and, with improved geometry and a non-fracture-critical design, would also provide the reliable, long-term solution needed to serve this purpose of the proposed project.

Although US 181 including the Harbor Bridge is currently designated a hurricane evacuation route in the State plan, the TSM Alternative would not provide a reliable, long-term solution because this alternative would not add shoulders to the existing bridge and would not address other geometric deficiencies related to safety. Without these more substantive corrections, US 181 under the TSM Alternative would not satisfy this hurricane evacuation criterion and would not meet the need and purpose for the proposed project.

In evaluating the Blue Alternative, which has an alignment that veers out into Corpus Christi Bay, TxDOT notes two elements that could be potentially problematic for hurricane evacuation: 1) the bridge structure would be over water for a distance greater than 7,700 feet and, therefore, more exposed in the event of a major hurricane; and 2) the bridge columns placed out in the bay would increase the likelihood that storm-surge debris could render the highway inoperable after a hurricane, hampering recovery efforts and the influx of emergency personnel and supplies.

The Tunnel Alternative similarly includes elements that would be potentially problematic during a hurricane evacuation. Although the tunnel carrying US 181 under the Corpus Christi Ship Channel would be designed to minimize flooding, reducing the likelihood of storm-surge flooding to zero percent is not feasible, and the implications of a flooded hurricane evacuation route include endangerment and loss of human life. In its Technical Guidelines for Hurricane Evacuation Studies the U.S. Army Corps of Engineers (1995) advises that "[i]n choosing roadways for the hurricane evacuation network, care should be taken to designate only those roads that are not expected to flood from rainfall or storm-surge while the evacuation is in progress." TxDOT and FHWA agree with and adopt this guideline. Another implication of a flooded tunnel includes a delay in the recovery efforts following a hurricane. Flood waters would need to be pumped from the tunnel, adding time to the duration between the end of the storm event and the start of the recovery effort. Pumping of flood waters from the tunnel is assumed to yield results that are unpredictable at best, due to the range of potential functionality of the pumping apparatus, from operating at full capacity, to intermittent operation, to malfunction and inaction.

For reasons stated, TxDOT, as the state agency responsible for identifying the most appropriate hurricane evacuation routes for the Corpus Christi area, would not be able to recommend the Blue Alternative or the Tunnel Alternative to the Texas Department of Public Safety's (DPS) Division of Emergency Management for inclusion in Texas' Hurricane Response Plan. TxDOT officials met with officials from DPS on January 23, 2012, and the TxDOT officials relayed their concerns and discussed these recommendations. DPS has not expressed any objection to TxDOT's recommendations.

In light of the foregoing, the Blue, Tunnel and TSM Alternatives would not serve as reliable, long-term hurricane evacuation routes for the Corpus Christi area and would, for that reason, not meet the need and purpose for the project.

2.3.2 Summary of the Screening Results

Based on the preceding screening analysis, the following build alternatives (see **Figure 2.3-1**) meet the need and purpose for the proposed project and are given full consideration as *reasonable alternatives* in the DEIS: Green Alternative, Red Alternative, Orange Alternative and West Alternative. The No Build Alternative is also given full consideration as a means of comparing the effects of each of the build alternatives. The Blue Alternative, Tunnel Alternative and TSM Alternative do not meet the need and purpose for the project and are, therefore, not considered reasonable and will not be considered further in the DEIS.

The range of *reasonable alternatives* was established based on the input from and collaboration with cooperating and participating agencies and the public, and further modified and refined by FHWA and TxDOT to what is presented herein; furthermore both lead agencies developed the screening analysis using the measures of effectiveness.

2.4 RANGE OF REASONABLE ALTERNATIVES

This section describes the reasonable build alternatives in greater detail and includes a discussion of the engineering considerations applicable to the design as means to satisfy the purpose of the project as well as the project objectives. The No Build Alternative is described in **Section 2.2.8**.

2.4.1 Description of the Reasonable Build Alternatives

2.4.1.1 Green Alternative

The Green Alternative (see **Figure 2.4-1**) would follow the existing US 181 alignment, having construction limits beginning 500 feet north of Beach Avenue on the north and ending at I-37 on the south, with a reconstructed interchange at the Crosstown Expressway and a transition back to existing I-37 ending just east of the Buddy Lawrence Drive overpass; the transition back to the existing Crosstown Expressway would be at Laredo Street. The location of the new bridge would be slightly offset to the west of the existing bridge to allow US 181 to remain open to traffic while construction proceeded on

the new bridge. The new bridge along the Green Alternative is proposed with an approximate low-chord elevation of 207 feet, meaning the bottom of the bridge structure would be 207 feet above the water surface of the ship channel. This compares with the existing bridge's low-chord elevation of 138 feet. In the context of the Harbor Bridge's location over the Corpus Christi Ship Channel, the low-chord elevation corresponds to the air-draft clearance for vessels entering and exiting the inner harbor at the Port of Corpus Christi; a vessel's air-draft clearance is the measure from the water surface elevation to its highest-most point, usually the top of the mast or a radio antennae.

The Green Alternative would have three 12-foot main lanes in each direction with a median barrier and 12-foot inside and 10-foot outside shoulders. This alternative would also include a 10-foot bicycle and pedestrian shared use path separated from the main lanes by a two-foot concrete barrier. The shared use path would extend from Carancahua Street on the south to Gulfspray Avenue on the north. Two-lane, one-way frontage roads in each direction would also be included north of the ship channel between Beach Avenue and Breakwater Avenue. The typical right of way width for this alternative would vary between 228 and 459 feet depending on the section of the alignment; the bridge and approach section would be the narrowest section, while the section of US 181 including frontage roads would typically be the widest.

This alternative would include a new interchange with I-37 with both the northbound I-37 connection to US 181 and the southbound US 181 connection to I-37 being modified relative to the existing facility.

Currently, I-37 eastbound to US 181 northbound is accessed by a right-hand exit ramp and a flyover crossing the I-37 entrance into Downtown Corpus Christi. With the proposed design, eastbound I-37 traffic would access US 181 directly without having to exit; traffic would exit east of N. Staples Street to access Downtown via a new eastbound frontage road. From Downtown, traffic currently accesses US 181 northbound via a ramp from Spur 544 west of Mesquite Street. With the proposed design, traffic from Downtown would travel west along a new westbound frontage road to N. Staples Street and utilize a dedicated turnaround to return eastbound, accessing US 181 northbound via the aforementioned flyover ramp.

Southbound US 181 traffic currently accesses Downtown Corpus Christi via a left hand exit south of Belden Street, connecting to Twigg Street, which is one-way eastbound, and N. Upper Broadway Street, which is one-way southbound. This configuration was identified in the discussion of the need for the project as one of the design deficiencies intended to be corrected. In response, the proposed design removes the left hand exit and replaces it with a standard right hand exit to N. Staples Street, allowing traffic to access downtown via the dedicated turnaround to the eastbound US 181 frontage road.

Other changes to the US 181/I-37 interchange with the proposed design include the removal of the Tancahua Street and Carancahua Street one-way pair crossing I-37, and the northbound US 181 access ramp from Carancahua Street. Traffic heading northbound on Carancahua Street can currently cross I-37 to access Padre Street or access US 181 northbound via a direct ramp. With the proposed design, northbound Carancahua Street traffic heading to Padre Street would instead access the eastbound US

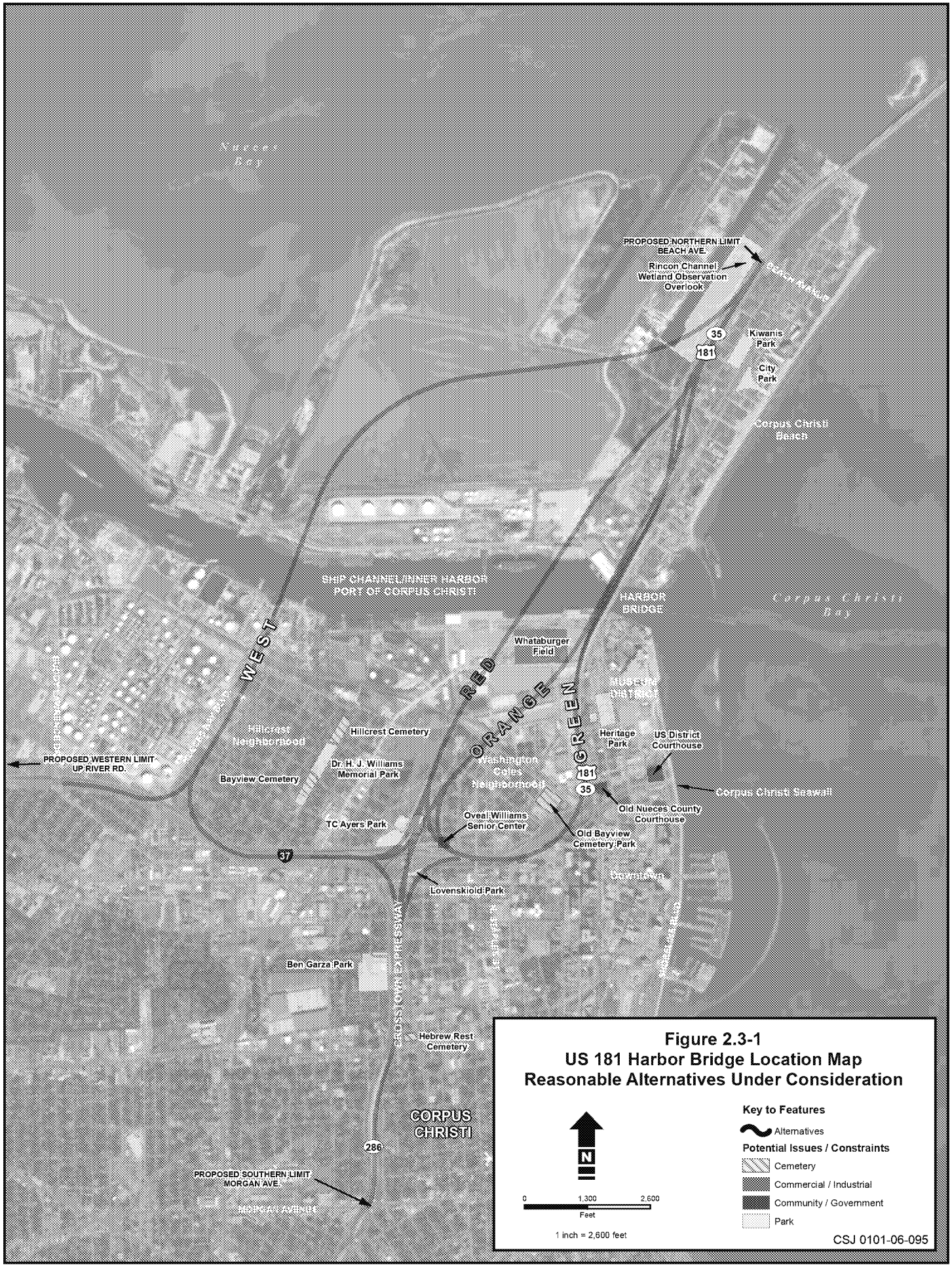
PROPOSED NORTHERN LIMIT
BEACH AVE.
Rincon Channel
Wetland Observation
Overlook
Kiwanis
Park
City
Park
Corpus Christi
Beach
35
181
SHIP CHANNEL/INNER HARBOR
PORT OF CORPUS CHRISTI
HARBOR
BRIDGE
Whataburger
Field
WEST
RED
ORANGE
GREEN
Hillcrest
Neighborhood
Hillcrest Cemetery
Heritage
Park
US District
Courthouse
PROPOSED WESTERN LIMIT
UP RIVER RD.
Dr. H. J. Williams
Memorial Park
Bayview Cemetery
Washington
Coles
Neighborhood
Corpus Christi Seawall
Old Nueces County
Courthouse
TC Ayers Park
Oveal Williams
Senior Center
Old Bayview
Cemetery Park
37
Lovenskiold Park
Ben Garza Park
Hebrew Rest
Cemetery
CORPUS
CHRISTI
286
PROPOSED SOUTHERN LIMIT
MORGAN AVE.
Figure 2.3-1
US 181 Harbor Bridge Location Map
Reasonable Alternatives Under Consideration
N
0
1,300
2,600
Feet
1 inch = 2,600 feet
Key to Features
Alternatives
Potential Issues / Constraints
Cemetery
Commercial / Industrial
Community / Government
Park
CSJ 0101-06-095

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Figure 2.4-1

GREEN ALTERNATIVE

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181 frontage road and travel a short distance to N. Lower Broadway Street, turn left and then turn left again onto the westbound US 181 frontage road to access Tancahua, W. Broadway or Ramirez Streets. To access US 181 northbound, northbound traffic on Carancahua Street would continue to N. Staples Street to utilize the dedicated turnaround to enter US 181 via a ramp from the eastbound frontage road.

The Green Alternative would also include a reconstructed interchange at the Crosstown Expressway and I-37, including reconstruction of the four existing direct connector ramps (I-37 westbound to SH 286 southbound, I-37 eastbound to SH 286 southbound, SH 286 northbound to I-37 westbound and SH 286 northbound to I-37 eastbound). Substantive changes in access are not proposed relative to the current condition of the interchange, although certain points of access to and from I-37 would be modified. Currently, westbound traffic on I-37 crossing from US 181 can exit at Brownlee Boulevard to travel either north into the Washington Coles and Hillcrest neighborhoods, or south towards Agnes Street. Under the proposed design, this exit would be removed and access to Brownlee Boulevard would be provided via the N. Staples Street exit (approximately one half mile further east). In addition, southbound traffic on Brownlee Boulevard currently can access an eastbound I-37 on-ramp directly. With the proposed design, that on-ramp would be removed with traffic routed eastbound along the eastbound US 181 frontage road to access either US 181 northbound or downtown Corpus Christi. South of I-37, Lipan Street and Comanche Street, which currently extend over the Crosstown Expressway, would be closed between the northbound and southbound frontage roads and traffic intending to cross the expressway at these locations would be rerouted through the frontage road intersection at the I-37/Crosstown Expressway interchange. Lastly, an entrance ramp from the westbound frontage road to I-37 westbound just west of Brownlee Boulevard would be removed. Traffic intending to enter the interstate at that location would be routed along the westbound frontage road to enter I-37 west of Nueces Bay Boulevard or along Winnebago Street eastward to access the westbound frontage road and enter I-37 just west of Alameda Street.

Other changes in access are proposed along US 181 both north and south of the Corpus Christi Ship Channel. On the north side of the ship channel, traffic can currently exit and enter US 181 at Burleson Street. With the proposed design, the first northbound exit from US 181 would be at Beach Avenue; there would be a southbound US 181 entrance at Beach Avenue, while the entrance at Burleson Street would be removed. In addition, the existing East Causeway Boulevard entrance to northbound US 181 just south of Burleson Street would also be removed. Cross-street access north of the ship channel would be maintained at Beach Avenue, Burleson Street and Breakwater Avenue.

South of the ship channel and north of the I-37 interchange, several streets currently without access across US 181 are designed as vehicular underpasses with the proposed project. Belden Street, Brewster Street and Port Avenue would be maintained as cross-streets under US 181, and Hughes, Fitzgerald, Palo Alto and Power Streets would all be extended under US 181 to connect with Tancahua Street to the west.

The preliminary construction cost estimate for the Green Alternative is $600 million. Costs for right of way acquisition, utility relocation and mitigation would be added to this figure once design details are more fully developed.

2.4.1.2 Red Alternative

The Red Alternative (see **Figure 2.4-2**) would be on a new location alignment west of existing US 181 and the Harbor Bridge. The new bridge would be 1,000 feet to the west of the existing bridge. This alternative would include a reconstructed interchange at I-37 and the Crosstown Expressway. The construction limits for the Red Alternative would be 500 feet north of Beach Avenue on the north and Crosstown Expressway at Laredo Street on the south, with a transition back to existing I-37 at Buddy Lawrence Drive on the west and Shoreline Boulevard on the east. The new bridge along the Red Alternative is proposed with an approximate low-chord elevation of 216 feet.

The Red Alternative would have three 12-foot lanes in each direction with a median barrier and 12-foot inside and 10-foot outside shoulders. This alternative would also include a 10-foot shared use path on the main span of the bridge and the bridge approaches, separated from main lane traffic by a two-foot concrete barrier. Two-lane, one-way frontage roads in each direction would also be included north of the ship channel between Beach Avenue and Coastal Avenue. The typical right of way width for this alternative would vary between approximately 200 feet for the bridge section over the ship channel and 430 feet for the main lane sections of US 181 with frontage roads.

The existing Harbor Bridge and the US 181 embankment on both the north and south approaches to the bridge would be removed as part of this proposed alternative. US 181 would be converted to an at-grade boulevard section, utilizing a realigned one-way pair (Tancahua Street southbound and Carancahua Street northbound) to access the existing surface streets downtown.

The Red Alternative would reconstruct the I-37/Crosstown Expressway interchange, including four direct-connector ramps (US 181 southbound to I-37 westbound, I-37 eastbound to US 181 northbound, SH 286 northbound to I-37 westbound and I-37 eastbound to SH 286 southbound). On the north side of I-37 several points of access and the configuration of certain surface streets would be modified. Brownlee Boulevard and a portion of Winnebago Street would be removed with the eastbound traffic currently utilizing Brownlee Boulevard to access the I-37 main lanes being rerouted to Coke Street, which would continue to provide direct access to the I-37 westbound frontage road. Access to the I-37 main lanes from there would be via an on-ramp west of Buddy Lawrence Drive, approximately 1.5 miles to the west of what is currently Brownlee Boulevard. Alternatively, traffic would be able to utilize Nueces Street to cross proposed US 181 to the west to Sam Rankin Street, turning south to return to Winnebago Street. From there traffic would continue eastward to Alameda Street to access the westbound I-37 frontage road and an I-37 main lane entrance ramp approximately 200 feet to the west of Alameda Street.

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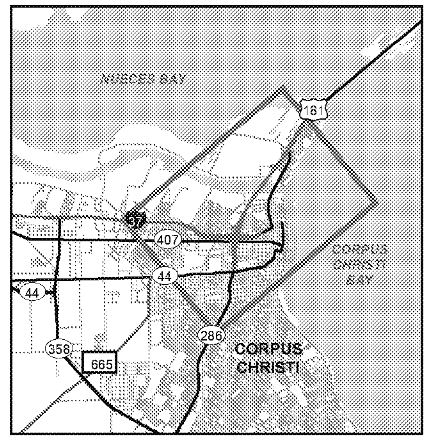

LOCATOR DIAGRAM

Key to Features

- Red Alternative

Landuse Types

- Cemetery
- Community / Government
- Park
- Utility
- Upland Confined Placement Area

0 800 1,600
Feet
1 inch = 1,600 feet

Figure 2.4-2

RED ALTERNATIVE

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North of the Corpus Christi ship channel, proposed US 181 would return to the existing alignment at Burleson Street with the first northbound exit to be provided at Beach Avenue. A southbound exit ramp would be provided to Burleson Street, and there would be a southbound US 181 entrance ramp at Beach Avenue as well. The existing northbound exit and southbound entrance at Burleson Street would be removed with this proposed alternative. In addition, the existing East Causeway Boulevard entrance to northbound US 181 just south of Burleson Street would also be removed.

The preliminary construction cost estimate for the Red Alternative is $900 million. Costs for right of way acquisition, utility relocation and mitigation would be added to this figure once design details are more fully developed.

2.4.1.3 Orange Alternative

The Orange Alternative (see **Figure 2.4-3**) would be on a new location alignment west of existing US 181 and Harbor Bridge. The location of the new bridge would be offset approximately 100 feet to the west of the existing bridge to allow the existing bridge to remain open to traffic while construction proceeded on the new bridge. The new bridge along the Orange Alternative is proposed with an approximate low-chord elevation of 210 feet.

The Orange Alternative would have three 12-foot lanes in each direction with a median barrier and 12-foot inside and 10-foot outside shoulders. This alternative would also include a 10-foot shared use path separated from main lane traffic by a two-foot concrete barrier. The shared use path would extend from Morgan Avenue on the south to Beach Avenue on the north. Two-lane, one-way frontage roads in each direction would also be included north of the ship channel between Beach Avenue and Elm Street. The typical right of way width for this alternative would vary between approximately 200 feet for the bridge section over the ship channel and 430 feet for the main lane sections of US 181 with frontage roads.

This alternative would include a reconstructed interchange at I-37 and the Crosstown Expressway. The construction limits for the Orange Alternative would be 400 feet north of Beach Avenue on the north and Crosstown Expressway at Laredo Street on the south, with a transition back to existing I-37 at Buddy Lawrence Drive on the west and Shoreline Boulevard on the east.

The existing Harbor Bridge and the US 181 embankment on both the north and south approaches to the bridge would be removed as part of this proposed alternative. US 181 would be converted to an at-grade boulevard section, similar to the Red Alternative, utilizing a realigned one-way pair (Tancahua Street southbound and Carancahua Street northbound) to access the existing surface streets downtown.

The reconstruction of the I-37/Crosstown Expressway interchange with the Orange Alternative would include four direct-connector ramps (US 181 southbound to I-37 westbound, I-37 eastbound to US 181 northbound, SH 286 northbound to I-37 westbound and I-37 eastbound to SH 286 southbound). Changes in access related to the interchange would be similar to those described for the Red Alternative

and reference can be made to **Section 2.4.1.2** above for a description of the changes that would similarly result for the Orange Alternative.

North of the Corpus Christi ship channel, proposed US 181 would return to the existing alignment at Burleson Street with the first northbound exit to be provided at Beach Avenue. There would be a southbound US 181 entrance ramp at Beach Avenue and a southbound exit ramp to Burleson Street as well. The existing northbound exit and southbound entrance at Burleson Street would be removed with the Orange Alternative. In addition, the existing East Causeway Boulevard entrance to northbound US 181 just south of Burleson Street would also be removed.

The preliminary construction cost estimate for the Orange Alternative is $850 million. Costs for right of way acquisition, utility relocation and mitigation would be added to this figure once design details are more fully developed.

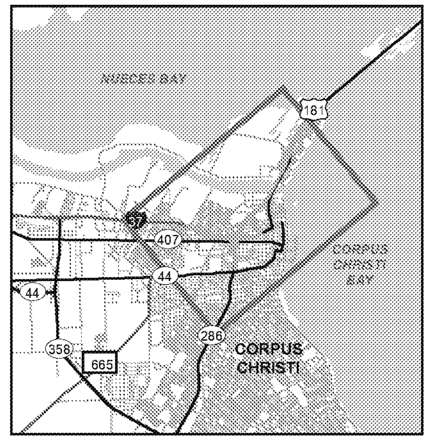
2.4.1.4 West Alternative

The West Alternative (see **Figure 2.4-4**) would be on a new location alignment west of existing US 181 and the Harbor Bridge. The new bridge would be approximately a mile and quarter to the west of the existing bridge. This alternative would include a new interchange at I-37 near Nueces Bay Boulevard and a reconstructed interchange at I-37 and the Crosstown Expressway, including reconstruction of two of the existing direct connector ramps (I-37 eastbound to SH 286 southbound and SH 286 northbound to I-37 westbound; the other two existing direct connector ramps would be removed. The construction limits for the West Alternative would be approximately 800 feet north of Beach Avenue on the north and I-37 on the south, with a transition back to existing I-37 approximately 450 feet past Up River Road on the west and N. Staples Street on the east; the transition back to the existing Crosstown Expressway would extend to approximately 600 feet south of Comanche Street. The new bridge along the West Alternative is proposed with an approximate low-chord elevation of 206 feet.

The path of the West Alternative runs parallel to and east of Nueces Bay Boulevard from I-37 to the ship channel. North of the ship channel, the eastward path of existing US 181 crosses the U.S. Army Corps of Engineers primary dredged spoils placement area for the ongoing maintenance dredging of the ship channel, a distance of approximately one and a third miles. The proposed West Alternative would return to the existing US 181 alignment approximately one quarter mile north of Burleson Street with the first northbound exit to be provided at Beach Avenue. There would be a southbound US 181 entrance ramp at Beach Avenue and a southbound exit ramp to Burleson Street as well. The existing northbound exit and southbound entrance at Burleson Street would be removed with the West Alternative. In addition, the existing East Causeway Boulevard entrance to northbound US 181 just south of Burleson Street would also be removed.

The West Alternative would have three 12-foot lanes in each direction with a median barrier and 12-foot inside and 10-foot outside shoulders. This alternative would also include a 10-foot shared use path separated from main lane traffic by a two-foot concrete barrier. The bicycle and pedestrian facilities

US 181 Harbor Bridge
Draft
Environmental Impact Statement
CSJ 0101-06-095



LOCATOR DIAGRAM

WESTERN PROJECT LIMIT
NORTHERN PROJECT LIMIT
EASTERN PROJECT LIMIT
SOUTHERN PROJECT LIMIT
Nueces Bay
Inner Harbor
Corpus Christi Bay
Corpus Christi
Harbor Bridge
Up River Rd
Buddy Lawrence Dr
Nueces Bay Blvd
Port Ave
Leopard St
Lipan St
Crosstown Expressway
Shoreline Blvd
Agnes St
Morgan Ave
Beach Ave
Westchester Park
Oak Park
Oak Park Recreation Center
Woodlawn Park
Post Office
International Longshoremen's Association
Fire Station
CC Police Officers Assn
Coastal Bend 911 Network
Nueces County Record Center
Holy Cross Cemetery
Rose Hill Memorial Park
Bayview Cemetery
Hillcrest Cemetery
Dr. H. J. Williams Memorial Park
TC Ayers Park
Lovenskiold Park
Habitat for Humanities ReStore
Willmot Park
Ben Garza Park
Navarro Place (CCHA)
Mother Teresa Shelter
City Hall
Nueces County Courthouse Complex
Hebrew Rest Cemetery
Good Samaritan Rescue Mission
Mary McLeod Bethune Day Nursery
Christus Spohn Memorial Hospital
Wiggins Homes (CCHA)
Retama Manor Nursing Center
Corpus Christi Police Athletic League
Arbor Adult Day Care
Gulf Coast Council of La Raza
CASA of the Coastal Bend
Nueces County Appraisal District & Fire Dept
CC Police Department & Municipal Courts
Art Center of Corpus Christi
Sherrill Park
Yacht Basin
Hannah's Hope
CC Fire Station
Corpus Christi Wastewater Plant
Port Police
Whataburger Field
Hurricane Alley Waterpark
Asian Cultures Museum
Ortiz Convention Center
Museum of Science & History
Bayfront Science Park
American Bank Convention Center
American Bank Center Arena
Heritage Park
Texas State Aquarium
U.S.S Lexington Museum on the Bay
U.S. Coast Guard Station
Texas State Aquarium Facility
Rincon Channel Wetland Observation Overlook
Surfside Park
Gulfspray Park
Beach Ave Park
Burleson Beach Park
Golf Place Beach Park
1. Salvation Army Men's and Women's Shelter
2. Workforce Solutions of the Coastal Bend
3. Spohn Park and World War Memorial
4. Antonio E. Garcia Arts Education Center
5. Leathers I (CCHA)
6. CC Public Library
7. Artesian Park
8. Bus Station
9. Elliott Grant Homes
10. Brooks Chapel Day Care Center
11. Blucher Park
12. Oveal Williams Senior Center
13. Christus Spohn Health Center
14. Harbor Playhouse
15. Corpus Christi Ballet
16. Cabra Park
17. Old Bayview Cemetery
18. South Texas Substance Abuse Recovery Services
19. U.S. Courthouse
20. ISD Building
21. Art Museum of South Texas
22. Kiwanis Park
23. Old Nueces County Courthouse
24. Chamber of Commerce & Visitors Bureau
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Key to Features

- Orange Alternative

Landuse Types

- Cemetery
- Community / Government
- Park
- Utility
- Upland Confined Placement Area

N

0 800 1,600
Feet
1 inch = 1,600 feet

Figure 2.4-3

ORANGE ALTERNATIVE

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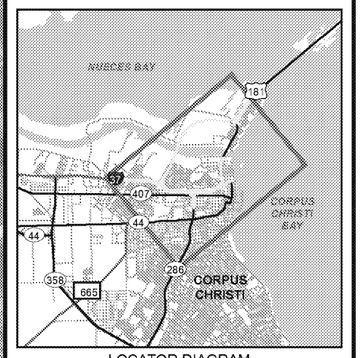
US 181 Harbor Bridge
Draft
Environmental Impact Statement
CSJ 0101-06-095



LOCATOR DIAGRAM

Key to Features

West Alternative

Landuse Types

- Cemetery
- Community / Government
- Park
- Utility
- Upland Confined Placement Area

0 800 1,600
Feet
1 inch = 1,600 feet

Figure 2.4-4

WEST ALTERNATIVE

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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would extend from Peabody Avenue at the I-37 westbound frontage road on the south to Gulfspray Avenue on the north. The typical right of way width for this alternative would be 320 feet to 570 feet. The existing Harbor Bridge and the US 181 embankment on both the north and south approaches to the bridge would be removed as part of this proposed alternative. Similar to the Red and Orange Alternatives, US 181 would be converted to an at-grade boulevard section, utilizing a realigned Tancahua and Carancahua Streets one-way pair—Tancahua Street southbound and Carancahua Street northbound—to access the existing surface streets downtown.

The preliminary construction cost estimate for this alternative is $700 million. Costs for right of way acquisition, utility relocation and mitigation would be added to this figure once design details are more fully developed.

2.4.2 Build Alternatives Summary

Table 2.4-1 below provides a summary comparison of the reasonable build alternatives. The cost estimate is a preliminary estimate of construction costs, not including the cost for right of way acquisition, utility relocation or any necessary mitigation.

Table 2.4-1 Build Alternatives Summary

Alternative	Bridge Height (ft)	Alternative Length (mi)	Main Bridge Span Length (ft)	Estimated New Right of Way Required (ac)	Estimated Construction Cost (millions)
Green	207	4.0	700	30	$600
Red	216	4.0	1,642	50	$900
Orange	210	4.0	860	50	$850
West	206	5.32	1,000	77	$700

Source: US 181 Harbor Bridge EIS Team 2013

2.4.3 Engineering Considerations

2.4.3.1 Federal and State Highway Design Standards

In developing the engineering design for the proposed build alternatives, project engineers have the requirements of several design manuals as well as other guidance to consider. One of the primary considerations is the requirement to bring the design of the existing facilities (US 181, I-37 and the Crosstown Expressway) into compliance with the current National Highway System (NHS) standards, described in Title 23 Code of Federal Regulations (CFR) Section 625.4. Project engineers are also required to adhere to the standards in TxDOT's Roadway Design Manual and Bridge Design Manual; a minimal number of design exceptions potentially being approvable where justified and necessary to avoid substantively impacting human and natural environmental resources. These combined standards require the engineers to consider, among other details, providing shoulders on any new bridge structure and the approaches, lessening the steepness of the vertical grade from five percent to four percent,

providing a main lane design speed of 70 miles per hour, adding bicycle and pedestrian facilities into the design where appropriate, and providing adequate acceleration and deceleration distances on the entrance and exit ramps. Engineers also need to consider traffic congestion, measured by the Level of Service (LOS), and how the proposed designs blend with the existing network of local streets and adjacent land uses. With respect to the bridge design itself, although details relating to the type of structure are still in the conceptual stage, the proposed bridge would not have a fracture-critical design as the existing bridge does.

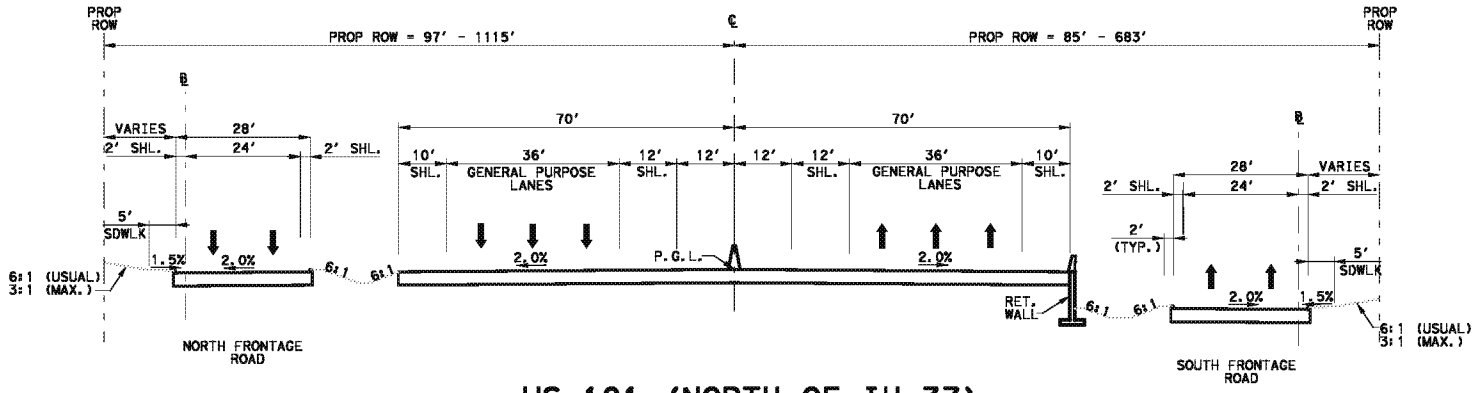
At this stage of the proposed project, engineers have produced preliminary schematic designs for each of the four reasonable build alternatives, and these designs are still subject to revision based on detailed traffic analysis that has yet to be completed and a determination of the LOS provided by each alternative, including the No Build Alternative. Referring back to **Section 2.4.1** will provide the reader with a description of the preliminary engineering design relative to the current FHWA and TxDOT standards mentioned above. **Figure 2.4-5** provides an illustration of the typical section of the proposed bridge from the driver's perspective, showing the number and dimensions of the travel lanes and shoulders, the relation of the shared use path to the vehicle lanes, and the usual width of the proposed right of way, which varies greatly depending on the point along the alignment. At this stage of the preliminary design, the typical sections for each of the four reasonable build alternatives are identical.

2.4.3.2 Bicycle and Pedestrian Accommodations

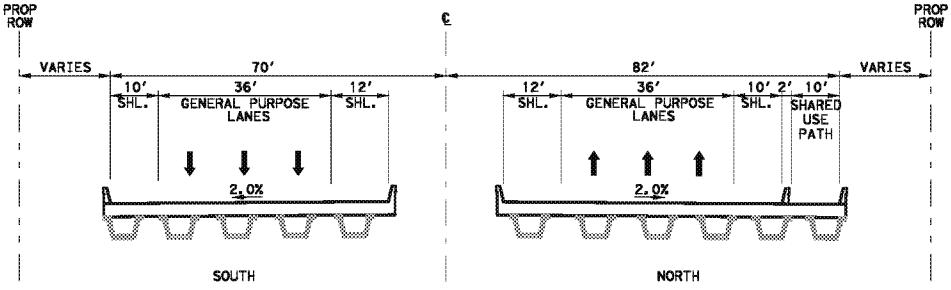
A design element of the proposed project is to improve conditions for bicyclists and pedestrians and to allow them to have safe, convenient access to the transportation system consistent with the U.S. Department of Transportation (DOT)'s March 2010 policy statement on bicycle and pedestrian accommodation and TxDOT's 2011 "Guidelines Emphasizing Bicycle and Pedestrian Accommodations." Bicycle and pedestrian facilities would be incorporated into the proposed design throughout the proposed project area, and would take into account the Corpus Christi Metropolitan Planning Organization's adopted Bicycle and Pedestrian Plan (2005) as well as additional input from the local cycling community. Details relating to the proposed design and location of bicycle and pedestrian facilities are presently being developed by project engineers and are therefore not fully available at this time. A major concept of the bicycle and pedestrian accommodations, as described under each of the proposed build alternatives (see **Section 2.4.1**), is the inclusion of a ten-foot shared use path—for use by both bicyclists and pedestrians—on the proposed bridge structure and the approach roadways. This proposed shared use path would be separated from vehicle traffic on the main lanes by a two-foot concrete barrier; details relating to shared use path ingress and egress are not available at this time and would be more fully addressed through the ongoing schematic design process.

2.4.3.3 Bridge Height – Navigational Air-Draft Clearance

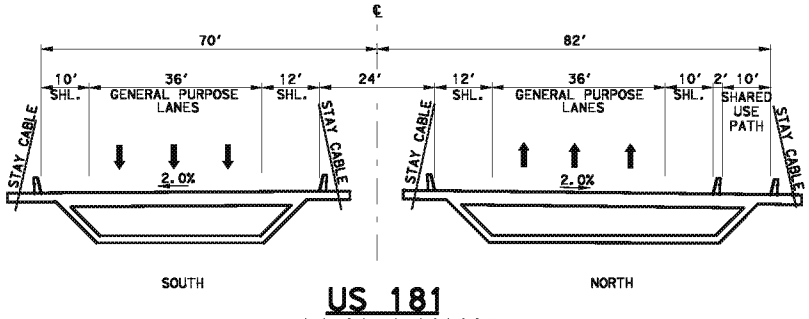
In pursuing the objective to *provide the transportation infrastructure to support the economic opportunities in the area*, when designing the proposed build alternatives project engineers are



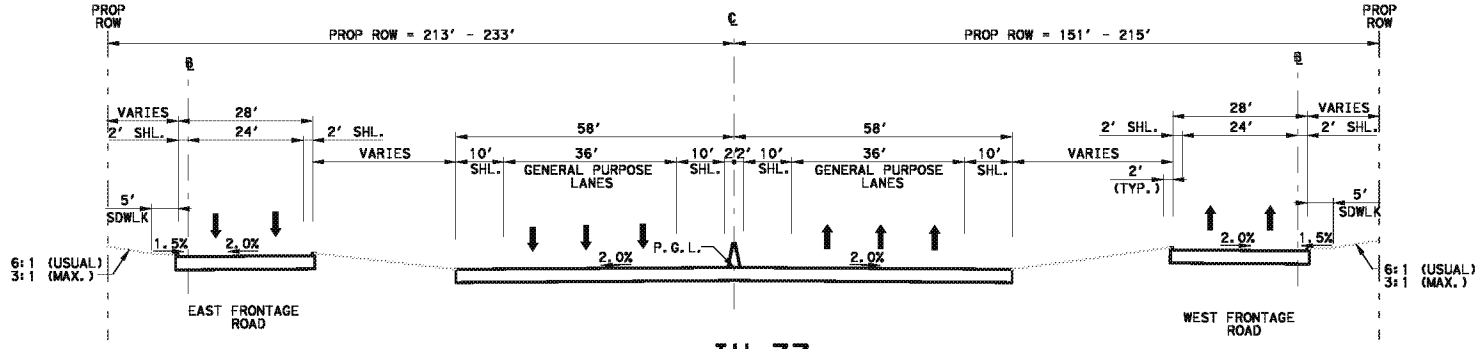
US 181 (NORTH OF IH 37)
SH 286 (SOUTH OF IH 37)
MAINLANES AND FRONTAGE ROADS



US 181
BRIDGE APPROACH



US 181
MAIN SPAN BRIDGE



IH 37
MAINLANES AND FRONTAGE ROADS

Figure 2.4-5
Proposed Typical Sections

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considering the height of the proposed bridge, which will determine the air-draft clearance vessels would need to maintain to call at the inner harbor at the Port of Corpus Christi (POCC). The existing Harbor Bridge provides 138 feet of vertical clearance, which means the maximum air-draft (the distance between the top of the water surface and the vessel's highest point) for vessels calling at the POCC's inner harbor is 138 feet. The existing Harbor Bridge was designed and built in the 1950s and, as a result, it accommodates vessel sizes of the post-World War II era. As the maritime industry has evolved with the expansion of global trade, the growth in size of modern ships and cargo has outgrown the Harbor Bridge's 138-foot vertical restriction. The 138-foot air draft is "impacting operations" at the port (Cambridge Systematics, Inc. 2010, 3-17), but also the ability of the State to meet the increasing freight traffic demands expected as a result of the expansion of the Panama Canal.

The Panama Canal expansion, expected to be completed in 2014, will increase the Canal's annual capacity by 75 percent, and while the demand for freight on the West Coast of the U.S. is likely to continue to be substantial in the future, the expansion of West Coast ports to accommodate increased freight shipments faces constraints, a result of which could be substantially more cargo being brought into Texas ports (Cambridge Systematics, Inc. 2011, 1).

Considering the minimum 201 to 205-foot vertical restriction at the Panama Canal and the importance the expansion of the canal is projected to play in the overall State plan for accommodating the increase in freight traffic along the Gulf Coast, the heights of the bridges proposed with each of the four build alternatives range from 206 feet to 216 feet.

2.4.3.4 Level of Service

The measure of the operational condition of a highway as perceived by the driver is characterized as that highway's Level of Service (LOS). LOS is broken into categories ranging from A to F, with A representing free-flow operations and F representing very congested traffic conditions. In the publication *A Policy on Geometric Design of Highways and Streets*, the American Association of State Highway and Transportation Officials (AASHTO) recommends that urban freeways and their auxiliary facilities should generally be designed for LOS C in urban areas. TxDOT has adopted these standards, stating in their Roadway Design Manual (TxDOT 2010) that "[f]or acceptable degrees of congestion, urban freeways and their auxiliary facilities should generally be designed for level of service C…in the design year," and that "[i]n heavily developed urban areas, level of service D may be acceptable." Both US 181 and I-37 within the proposed project area are considered urban freeways. The proposed project area is not, however, considered heavily developed; therefore LOS C is the design standard for the proposed project. Full analysis of design-year traffic conditions for the build alternatives is ongoing as part of the preliminary schematic development phase of the project. In the interim, the best available information comes from the Corpus Christi MPO's (CCMPO) Regional Travel Demand Model (projected to yield 2030 and 2035 traffic volumes), and these data were used to generate level of service results for the No Build Alternative. The model results indicate that with no improvements, US 181 would operate at LOS E in 2035 (URS 2011).

Traffic studies conducted in 2012 by URS Corporation for the Green, Red and Orange Alternatives indicate that under any of these scenarios US 181 would operate at LOS C for both morning (AM) and evening (PM) commutes in the year 2030. Note that these studies are currently being updated using the CCMPO's assumptions for the 2040 Regional Travel Demand Model, and that LOS results will be modeled for the proposed project's design year of 2043.

Traffic conditions for the West Alternative were analyzed for both the AM and PM commute times. The preliminary design for the West Alternative would utilize the existing direct connectors between I-37 and SH 286. For the AM commute, traffic would operate at LOS D in the following locations: the entrance ramp segment of I-37 on the southbound US 181 direct connector to I-37 eastbound; and the exit ramp segment of I-37 on the existing eastbound I-37 direct connector to southbound SH 286. Traffic would operate at LOS E along the I-37 main lanes between the southbound US 181 direct connector entrance to I-37 eastbound and the exit from I-37 eastbound to SH 286 southbound.

For the PM commute, traffic would operate at LOS D in the following locations: the entrance ramp segment of I-37 on the existing northbound SH 286 direct connector to westbound I-37; the I-37 main lanes from the entrance to I-37 from the existing northbound SH 286 direct connector to the westbound I-37 direct connector to northbound US 181; and the exit ramp segment of I-37 on the westbound I-37 direct connector to northbound US 181. Traffic would operate at LOS F along the I-37 main lanes between the entrance to I-37 westbound from SH 286 northbound and the westbound I-37 direct connector bridge to northbound US 181.

2.4.3.5 Connectivity of US 181 to the Local Roadway System

Project engineers are preliminarily designing the build alternatives in pursuit of the objective *to consider their connectivity to the local roadway system and the effects that connectivity has on adjacent neighborhoods*. **Section 1.3.2** discusses the effect that the original late-1950s and early 1960s construction of US 181 and I-37 had on the downtown Corpus Christi area and the neighborhoods in that vicinity, namely the change in access to and from the neighborhoods and the central business district. More contemporarily, as the downtown area has expanded to include a new convention center and an arts and entertainment district, the design of the US 181/I-37 interchange and the access to and from the Harbor Bridge has resulted in traffic congestion issues on US 181 and local downtown roadways during major events.

In the attempt to address these connectivity issues, the design of the proposed build alternatives provides an opportunity to enhance vehicular, bicycle and pedestrian travel to and from adjacent neighborhoods and the downtown area relative to the existing local roadway network. Under the Red, Orange and West Alternatives the opportunity for enhancement is primarily through the proposed placement of US 181 on a new location alignment and the removal of the existing US 181 alignment between roughly Beach Avenue and the US 181/I-37 interchange, to be replaced with a new, at-grade city street. This action would eliminate the embankment of US 181 with the intent of removing or minimizing the perceived barrier between the adjacent neighborhoods and the Corpus Christi central

business district. Along with adding bicycle and pedestrian facilities to the proposed highway design, eliminating the existing US 181 embankment would then allow for greater mobility for vehicles as well as bicyclists and pedestrians to travel to and from the downtown area and other major destinations as well, including North Beach, the Texas State Aquarium, the USS *Lexington* museum, the Bayfront Science Park, the Congressman Solomon P. Ortiz International Center, and Whataburger Field.

The engineering design of the Green Alternative, which would largely reconstruct US 181 in its existing location, would not preclude the addition of similar connectivity enhancements, the details of which are to be determined through public participation and collaboration with the City of Corpus Christi and the potentially affected neighborhoods.

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